Announcing WebGeocalc Version 1.0.0

Rev. 0 October 2013

http://wgc.jpl.nasa.gov:8080/webgeocalc

NASA's Navigation and Ancillary Information Facility (NAIF) announces the availability of a new kind of interface to the "SPICE" observation geometry calculations used by many space science missions and related endeavors. By "observation geometry" we mean positions and velocities, orientations, sizes and shapes, and a host of parameters derived therefrom. This graphic (http://naif.jpl.nasa.gov/naif/solar_system_geometry.pdf) illustrates some of these items.

From a standard web browser a WebGeocalc (WGC) customer uses traditional GUI controls—fill-in boxes, drop-down menus, radio buttons and check boxes—to tell the WGC server which observation geometry calculation is wanted and which mission's SPICE kernel set, or which specific SPICE kernels, are to be used. Upon pressing a CALCULATE button the result appears on the customer's screen moments later.

WebGeocalc may be used to compute geometric parameter values as a function of time (e.g. phase angle or altitude at time T), or time intervals when a geometric condition exists (e.g. occultation or transit) or when a geometric parameter is within a specified range or has reached a maximum or minimum value (e.g. surface intercept longitude is in the range of 35 to 50 degrees). It may also be used for a variety of time conversions.

In many cases graphical output is available. The numeric, time interval, and graphical results may be downloaded to the user's machine for use in publications or local tools. Numeric or time interval results may also be used as input for a subsequent WGC computation.

It is envisioned WGC can serve multiple purposes.

- Help a user check his/her own SPICE-based program under development
- Help a user quickly solve a space geometry problem
- Allow those unable to write a SPICE-based program to nevertheless make space geometry computations
- Help a peer reviewer do spot checks of geometry parameters contained in an archive about to be submitted to an archive center

The NAIF Group will maintain a WGC server along with the underlying large collection of archived kernels that have been delivered to the Planetary Data System's NAIF Node. NAIF's WGC server also has access to many mission operations kernels, and to a variety of mission independent "generic kernels."

WGC does not replace the traditional approach to using SPICE–that of writing one's own program that makes use of some SPICE APIs (functions); the majority of SPICE users will continue to use a locally-run SPICE-aware program for many geometry calculations.

While aimed at making computations more easily accomplished, using WGC requires some understanding of observation geometry, and some knowledge of SPICE capabilities, practices and lingo. Nevertheless, WGC should help non-programmers make some kinds of space geometry calculations.

To help avoid problems using WGC users **must** read the "About the Data" and "Rules of Use" pages provided within the tool. Additionally, a very useful tutorial for WGC is available here: http://naif.jpl.nasa.gov/pub/naif/toolkit_docs/Tutorials/pdf/individual_docs/47_webgeocalc.pdf

WGC Version 1.0.0 provides access to a portion of the SPICE Toolkit's capability. NAIF hopes to be able to somewhat extend the current WGC functionality in the future, based on suggestions from our alpha-test reviewers and from the users of this release, and also based on NAIF's own assessment of important but missing functionality. The text at the end of this announcement gives some examples of possible additions.

Providing this kind of interface to SPICE has been quite a challenge for NAIF. A number of decisions about how WGC should work had to be made; we picked approaches we think would be best for the majority of SPICE users, and we've tried to allow for options as much as seems appropriate. But some of you will find the way WGC works, or the data made available to WGC, not to your liking. Use the Feedback button to advise NAIF of any problems you encounter, or to provide your suggestions for improving its usefulness or usability.

"WebGeocalc" has been our working title for this tool, but does not seem to be the best possible name. ("Geocalc" appears all over the WWW.) Our alpha-reviewers have suggested: Spicey, Spice online, ezSPICE, WebSPICE, Spicecalc, WebAstrocalc, WebGeoCalc, SPICIER, MELANGE (from the novel Dune), and spicebrowser. Should you have a suggestion for a name, let us know.

NAIF, Caltech/JPL and NASA reserve the right to discontinue support of WGC at any time, without prior notice. Be sure to read the "Rules of Use" contained within WGC.

Acknowledgments
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Examples of Known Issues in WGC Version 1.0.0

Some of the many suggestions NAIF has collected for extending WGC functionality and improving its operability are listed below.

Missing Calculations

1. Geometry calculator: pointing direction
2. Geometry calculator: coordinate system transformations
3. Geometric event finder: search on range rate condition
4. Geometric event finder: search on illumination angles
5. Geometric event finder: search on angular size
6. Geometric event finder: search for eclipse

Other Missing Functionality

1. Allow inversion of found geometric event windows
2. Allow user to display the contents of text kernels, and to run summary tools on binary kernels
3. Allow user to save and later re-use a kernel configuration
4. Provide some kinds of geometry visualization capabilities, both static and animated
5. Read from the Digital Shape Kernel (DSK) subsystem currently under development
6. Read from a star catalog kernel
7. Add a command language capability
8. Allow use of DSN station masks in computing station-centric visibility of objects

Usability Issues

1. Allow a user to upload to the WGC server and then use his/her own kernel(s)
2. Provide much improved access to mission operations kernels, especially "predict" types useful in a variety of planning activities. (This is not so much a WGC problem, rather a kernel management issue!)
3. Provide a programmatic interface (e.g. RESTful) to the underlying WGC geometry engine
4. Allow a user to dynamically construct and save a meta-kernel
5. Provide improved report generation
6. Allow plot un-zooming one step back at a time
7. Provide a log file capability (for numeric output?; for graphical output?)
8. Provide improved on-line help, possibly including a glossary
9. Maybe a simpler version of WGC should be offered in addition to this one–one without all the bells and whistles?
10. Provide some WGC usage tutorials and examples

Additionally, some of the plotting capabilities could be substantially improved. That said, our general view is that most users will want to export numeric results to their own computers and then use favorite, local plotting programs.